U.S. Department of Transportation
Office of Public Affairs
Washington, D.C.
www.dot.gov/affairs/briefing.htm

Speech

Remarks of
Jeffrey N. Shane
Under Secretary of Transportation for Policy
Workshop on Optics and Photonics in
Transportation and Infrastructure
December 10, 2003

Thank you for inviting me to this very timely workshop. We are here to identify the most promising areas for applying advanced optical technologies to the transportation sector. It is a particular privilege to be with you today representing Secretary Norm Mineta, someone who knows a little bit about technology. Having served for many years as both a mayor of San Jose and later as the congressional representative for Silicon Valley, Secretary Mineta has a unique appreciation for the importance of technological development to our society and to our economy. He wanted me to pass along his personal encouragement to all of you here today as you work to make our transportation systems safer and more efficient through the development of new, cutting edge technologies.

To assist you in developing your roadmap for how advanced optics and photonics technologies can affect the future of transportation, I want to share with you an overview of our strategic goals and program priorities, and how those objectives are linked to the work that you do.

To achieve the our transportation sector objectives, which are carefully laid out in DOT's recently released five-year strategic plan, we will depend heavily on advanced technology solutions that can improve our Nation's safety, security and economic well-being. The technology-based solutions of the future will foster a more efficient, more productive and more robust national transportation system and, therefore, provide more convenient and reliable transportation services for travelers and shippers across the country and around the world.

The adoption of advanced technology in all areas of transportation – infrastructure, vehicles and operations – is critical to achieving measurable improvements in transportation safety, mobility and environmental performance. In fact, technology development has become a major focus for the Department as we work to implement safer, simpler, and smarter transportation solutions.

Our current strategic plan highlights DOT's mission of providing fast, safe, efficient, and convenient transportation at the lowest possible cost. In pursuit of that mission, we are actively engaged in building partnerships with federal, State and local officials; with researchers like those at the Transportation Research Board and our University Transportation Centers; with industry organizations; with transportation users; and, finally, with scientific and technical societies like SPIE[1] and OSA[2].

Saving Lives

The Department's top priority, and one that has been the focus of much of President Bush's and Secretary Mineta's attention over the past three years, is to measurably improve safety across all modes of transportation. We still experience nearly 43,000 fatalities and 3 million injuries each year on our Nation's highways. If you aren't moved by the incalculable human suffering reflected in that statistic, you should at least object to the annual cost to our economy - $230 billion. This is nothing less than a national scandal, for which reason we are doing all we can at DOT to reduce the number of fatalities and injuries we experience in the years ahead.

In partnership with State and local transportation and law enforcement agencies as well as our stakeholders, we have set an ambitious national goal—to reduce the highway fatality rate to 1 per 100 million vehicle miles traveled by 2008, a 41% decrease from the levels we experienced in 1996. You might well ask how do we think we are going to do that. The answer is that we have included a series of proposals in the legislation proposal we submitted to Congress earlier this year – Safe Accountable Flexible and Efficient Transportation Equity Act, or SAFETEA. That bill, which reauthorizes our federal highway, transit, and highway safety programs through fiscal year 2009, would double funding for highway safety programs, provide incentive funds to states that increase safety belt use, and maximize flexibility so that State and local governments can put their own creative minds to work in using federal resources most effectively to address the numerous safety problems we face on our highways today. To realize the safety benefits of these program improvements, it is critical that Congress approves a six-year reauthorization bill as soon as possible, and that it includes these existing improvements in the new legislation.

Working with our colleagues at the Federal Aviation Administration, we have also set ambitious goals surrounding the safety of the flying public, namely to reduce fatal accidents in commercial aviation to just 0.01 per 100 thousand departures by 2008, in addition to achieving substantial reductions in the number of general aviation fatalities during that same timeframe. As many of you undoubtedly know, Congress recently approved a four-year reauthorization of the FAA's programs, providing increased funding for the agency's aircraft certification, safety inspection, and air traffic control resources. That bill also included a significant increase in the FAA's research budget,

[1] International Society for Optical Engineering
[2] Optical Society of America

which will be used in part to put the latest technologies to work in addressing critical aviation safety challenges. Saving lives is obviously a crucial part of our responsibility at the Department of Transportation, and so we take this work extremely seriously.

In pursuit of our safety objectives, over the past two decades DOT has developed, demonstrated, and deployed – in partnership with states, metropolitan planners, and industry – numerous Intelligent Transportation System technologies. ITS technologies help us to overlay a new communications and information infrastructure on the existing physical infrastructure to improve its safety, mobility and economic efficiency. ITS products and services rely on the most recent advances in electronics, computing and communication technologies, including the Global Positioning System for precise tracking of transport assets, and navigation. Services derived from these new technologies range from electronic toll collection and emergency notification to enhanced driver information and vehicle or fleet management systems.

The Intelligent Vehicle Initiative, a partnership between DOT and the automotive industry, is developing new collision avoidance options, lane position and blind spot monitoring technologies, and a range of vision and alertness aids for aging and commercial drivers. These applications will warn drivers of potentially dangerous situations and recommend, or even automatically initiate, corrective actions to avoid a collision. The benefits of full-scale, nationwide deployment of ITS technologies include not only improved safety, but also improved air quality and increased capacity and economic productivity through improved traffic flows and more efficient congestion management.

Numerous state-of-art optical devices are already integrated into the advanced ITS network being deployed in major metropolitan areas, while also assisting in traffic safety enforcement. Let me cite a few examples:

- Most cities use video cameras to transmit real time pictures of busy highways and intersections to Traffic Control Centers in order to better manage congestion and improve efficiencies. Those video-cam images are widely available online and in real time;

- Departments of Motor Vehicles and law enforcement agencies use video cameras to enforce traffic laws, collecting images of license plates to assess fees or fines; and finally,

- The ITS system installed in the Central Artery Tunnel (CAT) in Boston employs infrared height-detection sensors to activate variable message warnings to oversized vehicles in order to direct them away from the tunnel.

The IVI is also developing and testing novel collision avoidance, vision enhancement, driver condition monitoring and related applications that will warn drivers of dangerous situations, recommend corrective actions, and sometimes even assume partial control of the vehicle to avoid a collision. Consider some examples of how optics and photonics

are being used in this area:

- Infrared optics technology, developed to enhance night vision and afford advanced-warning of obstacles for aging or vision-impaired drivers, is available as an option in General Motors' Cadillac models;

- Automakers are now testing "smart cars" equipped with state-of-art lane-guidance devices and blind-spot warning technology to improve the safety of both cars and drivers; and finally,

- In aviation, the next generation aircraft will likely use Fly-by-Light technology, also known as "the glass cockpit", which is currently used only in military aircraft. When perfected by NASA, DOD and industry for commercial use, optical flight control systems could enhance aircraft controllability and stability in windy conditions while providing improved reliability due to immunity to electromagnetic interference, lighter weight and broader transmission spectrum, affording increased communications capacity and speed.

Enhancing Mobility

Another core objective of the Department of Transportation is something we like to call our "mobility imperative." Highway traffic congestion currently costs the American public about $68 billion a year in wasted time and fuel in our Nation's largest metropolitan areas alone. Similarly, aviation delays due to air traffic congestion cost passengers, shippers, and others involved in the industry an estimated $6.5 billion per year. Relief from highway and aviation congestion can pay substantial economic and social dividends, but requires significant investment in transportation infrastructure and operational improvements – all of which can be enabled by advanced technologies.

To improve mobility, we must manage transportation operations better while also working to renew our aging transportation infrastructure. This means actively monitoring infrastructure integrity and working to prevent catastrophic failures. Test and evaluation technologies are currently used to monitor infrastructure integrity and prevent the failure of aging tunnels, highways, bridges, overpasses and support pillars. That early warning of infrastructure degradation encourages preventive maintenance, averting catastrophic failures of critical bridges and highway pillars.

For example, the Federal Highway Administration just completed a Small Business Innovation and Research solicitation for a fiber optic sensor to measure internal concrete hardening and to monitor corrosion. The long-range opportunities of this technology include lower costs and more robust sensors that can be extensively deployed and integrated into networks to report infrastructure degradation to a central monitoring station, triggering near-immediate preventive repairs.

Combining computers, telecommunications, and positioning systems also facilitates real-time tracking of persons, packages and vehicles. Because the radio-frequency spectrum

is cluttered and reaching capacity, there is often a great deal of electromagnetic interference and encroachment. New communication systems, relying on fiber-optic network architectures and faster photonics communications promise more secure, higher capacity and more efficient networks, thus helping to enable a host of new transportation technologies.

One such technology that we are very excited about at DOT involves Digital Short Range Communications devices that allow vehicles to talk to roadside transponders to share information, improve safety and enhance traffic flows. We have been working closely with the FCC for some time to facilitate the dedication of the 5.9 gigahertz band of spectrum for these technologies, and are extremely pleased that the Commission will be considering a Final Report and Order on this subject at their December meeting. DSRC devices will deliver a whole host of transportation mobility and safety improvements, enabling DOT to deliver on two of its most important objectives.

Protecting our Environment

To meet future transportation demand, we must accelerate transportation project delivery while also taking appropriate measures to protect our environment. DOT always strives to balance the need for a safe and efficient transportation network with the importance of preserving environmental quality. Although transportation emissions of air pollutants are at their lowest levels in 30 years, the transportation community now faces new challenges, including more stringent standards for ozone and particulates and new pollutants of concern such as air toxics. Advanced optical technologies, ranging from on-road and tailpipe pollution monitoring to space-based remote sensing of air and water quality, can help support DOT's efforts to manage the environmental impacts of transportation.

Improving air quality by reducing mobile source emissions is a responsibility that we all share. Currently, a small percentage of vehicles emit a large percentage of the pollution from on-road vehicles. Near-term opportunities exist to develop low cost, reliable, in-vehicle diagnostics to help monitor tailpipe exhaust based on optical spectroscopy. Over the longer term, optical and infrared devices used to monitor roadside and tailpipe pollution levels could help to identify and remove the worst polluters, thus improving urban air quality. Devices of that kind can help us ensure an environmentally sustainable transportation future.

Perhaps the most important environmental initiative of this Administration is the President's call to move towards a hydrogen economy. Federal attempts to coordinate research towards deployment of cleaner cars using hydrogen fuel cells have been well publicized. Practical fuel cells for motor vehicles are likely to emerge in the next few years, and are already being tested on automobiles, trucks, and buses. DOT is an active participant in the Hydrogen Vehicle initiative as the agency responsible for both the safe transportation of hydrogen fuels via pipelines and tankers and the creation of safety standards for the crashworthiness of hydrogen-powered vehicles and fuel cell buses.

Finally, another important way in which the Bush Administration is working to deliver new transportation technologies is through the National Nanotechnology Initiative. Last Friday, President Bush signed the Nanotechnology Research and Development Act, which authorizes over $3.5 billion in funding for nanotechnology R&D over four years. The potential for developing nanotechnology-driven devices in transportation vehicles and infrastructure is only beginning to unfold, and could have a profound impact on our future. Examples of some of the potential nanotechnology applications in the transportation sector include:

- Embedded sensors in vehicle and infrastructure materials that monitor and communicate real-time conditions and identify maintenance needs;

- Durable, environmentally friendly coatings and stronger structural physical materials with new and improved properties for both vehicles and infrastructure;

- Molecular level computing and telecommunications systems that can operate transportation systems; and, finally,

- Carbon-based nanotubes that can serve as hydrogen carriers for vehicle fuel cells.

Conclusion

With your help and inputs, we will make progress towards a shared transportation vision of the future, one where technology plays an even more prominent role in delivering a safe, accessible, energy-efficient, and environmentally sound transportation system. Thank you for being here today. I look forward to receiving the technology roadmap that you will develop here today, and to working with all of you on these critical issues.

# # #